

AMENDMENTS TO THE CLAIMS

1. (Currently Amended): A method of automatically re-provisioning a network element in adaptation to a failure, the method comprising the computer-implemented steps of:

identifying a network element that has failed;

selecting a substitute network element from among a pool of one or more available

network elements;

receiving connection configuration information from the identified network element;

and

based on the connection configuration information, re-configuring the substitute

network element and one or more switch devices associated with the

identified network element, wherein the re-configuring causes the one or more
switch devices to change one or more connections from the identified network
element to the substitute network element.
2. (Currently Amended): [[A]] The method as recited in Claim 1, wherein the identified network element is one of a plurality of network elements in a cluster that is associated with first and second network switches.
3. (Currently Amended): [[A]] The method as recited in Claim 1, wherein the steps are performed by a cluster manager that is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one or more available network elements, a first network switch, and a second network switch.
4. (Currently Amended): [[A]] The method as recited in Claim 1, wherein the step of re-configuring comprises the steps of sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.

5. (Currently Amended): [[A]] The method as recited in Claim 1, wherein re-configuring comprises dynamically reconfiguring the selected network element as a logical clone of the identified network element.
6. (Currently Amended): [[A]] The method as recited in Claim 1, further comprising the step of associating the identified network element with the pool of available network elements.
7. (Currently Amended): [[A]] The method as recited in Claim 1, further comprising the steps of:
sending an initial configuration to the substitute network element;
sending a partial accumulated configuration to the substitute network element; and
sending instructions that cause the identified network element to reboot based on a configuration setting of a cluster associated with the identified network element.
8. (Currently Amended): [[A]] The method as recited in Claim 1, further comprising the steps of:
receiving first user input in a graphical user interface that associates the network elements in a cluster with a first switch and a second switch;
receiving second user input that specifies which network elements are reserved in the pool of available network elements.
9. (Currently Amended): [[A]] The method as recited in Claim 1, wherein each of the network elements is a network aggregation device or a network access server.
10. (Currently Amended): [[A]] The method as recited in Claim 1, further comprising repeating the steps for multiple concurrently failed network elements.

11. (Currently Amended): [[A]] The method as recited in Claim 1, further comprising the steps of:

receiving a message specifying a failure of a network element over an event bus on

which the network elements publish events and on which a cluster manager

subscribes to events;

based on the message, identifying the network element that has failed.
12. (Currently Amended): [[A]] The method as recited in Claim 1, wherein the network switches are asynchronous transfer mode (ATM) switches, and wherein the network elements are routers in a packet-switched network.
13. (Currently Amended): A method of automatically re-provisioning a network element in adaptation to a failure, the method comprising the computer-implemented steps of:

receiving first user input that defines a cluster comprising a first network switch, a plurality of network elements, and a second network switch;

receiving second user input that specifies one or more of the network elements as a pool of available network elements;

identifying a network element that has failed;

selecting a substitute network element from among the pool; and

re-configuring the first network switch and the second network switch, wherein the re-configuring causes the first network switch and second network switch to change one or more connections from the identified network element to the substitute network element.
14. (Currently Amended): [[A]] The method as recited in Claim 13, wherein the step of re-configuring comprises the steps of sending a trigger event to the substitute network

- element that causes the substitute network element to retrieve a configuration over a network connection.
15. (Currently Amended): [[A]] The method as recited in Claim 13, wherein re-configuring comprises dynamically reconfiguring the selected network element as a logical clone of the identified network element.
16. (Currently Amended): [[A]] The method as recited in Claim 13, further comprising the step of associating the identified network element with the pool of available network elements.
17. (Currently Amended): [[A]] The method as recited in Claim 13, further comprising the steps of:
- sending an initial configuration to the substitute network element;
- sending a partial accumulated configuration to the substitute network element; and
- sending instructions that cause the identified network element to reboot based on a configuration setting of a cluster associated with the identified network element.
18. (Currently Amended): [[A]] The method as recited in Claim 13, wherein each of the network elements is a network aggregation device or a network access server.
19. (Currently Amended): [[A]] The method as recited in Claim 13, further comprising repeating the steps for multiple concurrently failed network elements.
20. (Currently Amended): [[A]] The method as recited in Claim 13, further comprising the steps of:
- receiving a message specifying a failure of a network element over an event bus on which the network elements publish events and on which a cluster manager subscribes to events;

based on the message, identifying the network element that has failed.

21. (Currently Amended): [[A]] The method as recited in Claim 13, wherein the network switches are asynchronous transfer mode (ATM) switches, and wherein the network elements are routers in a packet-switched network.

22. (Currently Amended): A computer-readable medium ~~carrying~~ storing one or more sequences of instructions for automatically re-provisioning a network element in adaptation to a failure, which instructions, when executed by one or more processors, cause the one or more processors to carry out the steps of:

identifying a network element that has failed;

selecting a substitute network element from among a pool of one or more available
network elements;

receiving connection configuration information from the identified network element;

and

based on the connection configuration information, re-configuring the substitute

network element and one or more switch devices associated with the

identified network element, wherein the re-configuring causes the one or more

switch devices to change one or more connections from the identified network

element to the substitute network element.

23. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, wherein the identified network element is one of a plurality of network elements in a cluster that is associated with first and second network switches.

24. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, wherein the instructions are executed by a cluster manager that is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one

or more available network elements, a first network switch, and a second network switch.

25. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, wherein the instructions for re-configuring further comprise instructions for sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.
26. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, wherein the instructions for re-configuring further comprise instructions for dynamically reconfiguring the selected network element as a logical clone of the identified network element.
27. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, further comprising instructions for associating the identified network element with the pool of available network elements.
28. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, further comprising instructions for:
sending an initial configuration to the substitute network element;
sending a partial accumulated configuration to the substitute network element; and
sending instructions that cause the identified network element to reboot based on a
configuration setting of a cluster associated with the identified network
element.
29. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, further comprising instructions for:
receiving first user input in a graphical user interface that associates the network
elements in a cluster with a first switch and a second switch;

receiving second user input that specifies which network elements are reserved in the pool of available network elements.

30. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, wherein each of the network elements is a network aggregation device or a network access server.
31. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, further comprising instructions for repeatedly executing the instructions for multiple concurrently failed network elements.
32. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, further comprising instructions for performing the steps of:
receiving a message specifying a failure of a network element over an event bus on which the network elements publish events and on which a cluster manager subscribes to events;
based on the message, identifying the network element that has failed.
33. (Currently Amended): [[A]] The computer-readable medium as recited in Claim 22, wherein the network switches are asynchronous transfer mode (ATM) switches, and wherein the network elements are routers in a packet-switched network.
34. (Currently Amended): An apparatus for automatically re-provisioning a network element in adaptation to a failure, comprising:
means for identifying a network element that has failed;
means for selecting a substitute network element from among a pool of one or more available network elements;
means for receiving connection configuration information from the identified network element; and

means for re-configuring the substitute network element and one or more switch devices associated with the identified network element, based on the connection configuration information, wherein the re-configuring causes the one or more switch devices to change one or more connections from the identified network element to the substitute network element.

35. (Currently Amended): [[An]] The apparatus as recited in Claim 34, wherein the identified network element is one of a plurality of network elements in a cluster that is associated with first and second network switches.
36. (Currently Amended): [[An]] The apparatus as recited in Claim 34, wherein the apparatus comprises a cluster manager that is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one or more available network elements, a first network switch, and a second network switch.
37. (Currently Amended): [[An]] The apparatus as recited in Claim 34, wherein the re-configuring means comprises means for sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.
38. (Currently Amended): [[An]] The apparatus as recited in Claim 34, wherein the re-configuring means comprises means for dynamically reconfiguring the selected network element as a logical clone of the identified network element.
39. (Currently Amended): [[An]] The apparatus as recited in Claim 34, further comprising means for associating the identified network element with the pool of available network elements.
40. (Currently Amended): [[An]] The apparatus as recited in Claim 34, further comprising:

- means for sending an initial configuration to the substitute network element;
- means for sending a partial accumulated configuration to the substitute network element; and
- means for sending instructions that cause the identified network element to reboot based on a configuration setting of a cluster associated with the identified network element.
41. (Currently Amended): [[An]] The apparatus as recited in Claim 34, further comprising:
- means for receiving first user input in a graphical user interface that associates the network elements in a cluster with a first switch and a second switch;
- means for receiving second user input that specifies which network elements are reserved in the pool of available network elements.
42. (Currently Amended): [[An]] The apparatus as recited in Claim 34, wherein each of the network elements is a network aggregation device or a network access server.
43. (Currently Amended): [[An]] The apparatus as recited in Claim 34, further comprising means for using the other means repeatedly for multiple concurrently failed network elements.
44. (Currently Amended): [[An]] The apparatus as recited in Claim 34, further comprising:
- means for receiving a message specifying a failure of a network element over an event bus on which the network elements publish events and on which a cluster manager subscribes to events;
- means for identifying the network element that has failed, based on the message.

45. (Currently Amended): [[An]] The apparatus as recited in Claim 34, wherein the network switches are asynchronous transfer mode (ATM) switches, and wherein the network elements are routers in a packet-switched network.
46. (Currently Amended): An apparatus for automatically re-provisioning a network element in adaptation to a failure, comprising:
- a network interface that is coupled to the data network for receiving one or more packet flows therefrom;
- a processor;
- one or more stored sequences of instructions which, when executed by the processor, cause the processor to carry out the steps of:
- identifying a network element that has failed;
- selecting a substitute network element from among a pool of one or more available network elements;
- receiving connection configuration information from the identified network element;
- and
- based on the connection configuration information, re-configuring the substitute network element and one or more switch devices associated with the identified network element, wherein the re-configuring causes the one or more switch devices to change one or more connections from the identified network element to the substitute network element.
47. (Currently Amended): [[An]] The apparatus as recited in Claim 46, wherein the identified network element is one of a plurality of network elements in a cluster that is associated with first and second network switches.

48. (Currently Amended): [[An]] The apparatus as recited in Claim 46, wherein the steps are performed by a cluster manager that is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one or more available network elements, a first network switch, and a second network switch.
49. (Currently Amended): [[An]] The apparatus as recited in Claim 46, wherein the step of re-configuring comprises the steps of sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.
50. (Currently Amended): [[An]] The apparatus as recited in Claim 46, wherein re-configuring comprises dynamically reconfiguring the selected network element as a logical clone of the identified network element.
51. (Currently Amended): [[An]] The apparatus as recited in Claim 46, further comprising the step of associating the identified network element with the pool of available network elements.
52. (Currently Amended): [[An]] The apparatus as recited in Claim 46, further comprising the steps of:
sending an initial configuration to the substitute network element;
sending a partial accumulated configuration to the substitute network element; and
sending instructions that cause the identified network element to reboot based on a configuration setting of a cluster associated with the identified network element.
53. (Currently Amended): [[An]] The apparatus as recited in Claim 46, further comprising the steps of:

- receiving first user input in a graphical user interface that associates the network elements in a cluster with a first switch and a second switch;
- receiving second user input that specifies which network elements are reserved in the pool of available network elements.
54. (Currently Amended): [[An]] The apparatus as recited in Claim 46, wherein each of the network elements is a network aggregation device or a network access server.
55. (Currently Amended): [[An]] The apparatus as recited in Claim 46, further comprising repeating the steps for multiple concurrently failed network elements.
56. (Currently Amended): [[An]] The apparatus as recited in Claim 46, further comprising the steps of:
- receiving a message specifying a failure of a network element over an event bus on which the network elements publish events and on which a cluster manager subscribes to events;
- based on the message, identifying the network element that has failed.
57. (Currently Amended): [[An]] The apparatus as recited in Claim 46, wherein the network switches are asynchronous transfer mode (ATM) switches, and wherein the network elements are routers in a packet-switched network.